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Arterio-capillary fibrosis.



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ARTERIO-CAPILLARY FIBROSIS.

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EVERY cell inherits from its parent cell a certain lease of life, at the end of which physiological death occurs. This period, however, may be influenced by external conditions. Premature death is pathological. We cannot recognize a pathological longevity. Similar laws apply to the human individual, the composite of a vast aggregation of cells of widely differentiated function.

The life of man may be divided into three periods: that of evolution, of growth, of development; that of maturity, of perfection; and that of involution, of decline. The first begins with birth, the last ends with death.

During the period of growth and development, tissue-change and destruction—catabolism—are more than offset by tissue-construction and repair—anabolism. Nutrition exceeds waste. Building-up is more active than tearing-down. With the activity of life comes the demand for the highest differentiation of function of which the organism is capable. This represents the perfect individual. For a time, a condition of equilibrium is maintained. Sooner or later, however, the tide begins to turn. The equilibrium is disturbed. Waste exceeds repair. The cellular assimilative function becomes impaired, the constitution of the nutritive fluids defective. Tissues and organs are imperfectly furnished with the materials for their maintenance. Vascular changes occur. In a vicious circle, one baneful influence reacts upon another. The entire organism is reduced to a condition of deterioration. Finally, the state of nutrition falls to so low a level as to be insufficient for the purposes of life, and functional activity comes to a standstill. This is the physiological process, as it occurs at advanced age, and constitutes the condition of senility. Occurring at an earlier period, however, the process becomes pathological, recognized clinically by signs and symptoms which may be conveniently included in the designation premature senility.

As the component parts of the organism depend for their sustenance upon the nutritive elements of the blood, so will their functional stability be governed by the quality and quantity of the circulating medium. Thus, we would be led to look to the blood as containing the excitant which induces the earliest changes. The function of the cell once impaired, the deleterious action of the blood would be augmented by the retention of matters which it was the part of the cell to remove, and the addition of products from the degeneration of the cell.

Pathologically, the condition under discussion may be considered a general fibrous substitution and hyperplasia, displacing parenchymatous structures and narrowing the lumen of arteries and capillaries; hence the names arterio-capillary fibrosis, arterio-sclerosis.

The histological changes may arise in one of two ways, or in a combination of both. When tissue degenerates or is destroyed, nature endeavors to make restoration. The attempt is often only partially successful. The newly-formed tissue is apt to be of a lower grade than that which it replaces. The more highly organized the latter, the wider, of course, is the variance. In this way, fibrous tissue takes the place of vital structure. This is illustrated in the cicatrix, be it cerebral or cutaneous or parenchymatous. Under other circumstances, there occurs a primary hyperplasia of preëxisting connective-tissue, perhaps of a subacute or slowly chronic character, displacing the tissue proper to the organ, and finally leading to its disorganization. These two processes may be illustrated by the modern pathological conceptions of the changes that occur in certain diseases of the central nervous system. In the acute inflammatory disease known as anterior poliomyelitis, the destruction of the ganglion cells in the anterior horns of the gray matter of the spinal cord is followed by a reparative process, in which fibrous tissue replaces that which has been destroyed. In the systemic sclerosis, posterior and lateral; in the degenerations, ascending and descending, primary destruction of axis-cylinders takes place, with secondary substitution of fibrous tissue. In insular sclerosis, on the other hand, there is at first an increase in the connective-tissue, followed by gradual destruction of nerve-elements and interruption of function. The difference is that between inflammation and cirrhosis. Solid viscera may be unchanged in size. They are rarely enlarged, but often shrunken, from contraction of the fibrous elements. The coats of the vessels are thickened, and their lumen narrowed. In whatever structure the process begins, it is slowly progressive, especially if the exciting influence be maintained. The change, as it affects the arteries, is to be distinguished from atheroma, with which it may be associated. Both are evidences of senile disorganization. In atheroma, however, the process is one of fatty degeneration of the intima, giving rise to ulceration, which is in turn followed by cicatrization and calcification. In the one condition, clinically, the vessel, to the eye and to the examining finger, is tortuous and resistant; in the other, it is rigid and unyielding, like a pipe-stem. It is the difference between fibrous and calcareous infiltration.

The etiological elements concerned in the production of arterio-capillary fibrosis are comprised in the group of noxæ which we now know as toxic and infectious, and include syphilis, alcoholism, lead-poisoning, gout, rheumatism, and infectious diseases in general.

Heredity, too, probably plays some part in transmitting a predisposition to the occurrence of fibrous degeneration.

Perhaps the most conspicuous symptom, and that for which the patient first seeks relief, is shortness of breath on the slightest exertion. The onset of this condition is so insidious that the patient is unaware of its existence, until suddenly revealed by a demand for some special activity. With it is often associated palpitation, which the patient is apt to describe as a fluttering of the heart. The cardiac action is found to be irregular, perhaps intermittent, with occasional duplication of the second sound or an abortive first. The second sound is distinctly accentuated at the base. The pulse is tense and resistant. The temporal arteries are prominent and tortuous. In addition, the patient complains of coldness of the extremities or of numbness or of formication, with, perhaps, some muscular weakness. There may be vertigo, especially on sudden changes of posture, lightness in the head, as the patient says. The memory is impaired, and there may be headache. The knee-jerk is frequently exaggerated, but not always. Often there is tremor, and sometimes nystagmus. In some cases, the complexus of symptoms approaches that seen in insular sclerosis, in others that seen in paralysis agitans, though typical of neither. It may be that such cases represent incipient stages of the one or the other of these affections, which, in their turn, perhaps, may be more intimately related than we as yet know. Occasionally, we meet with transient pareses and local paralyses, sometimes ascribed to uræmia. It seems easier to explain the occurrence of these on the assumption of partial vascular occlusion. The feet are sometimes swollen. There is apt to be increased frequency of micturition of a urine of low specific gravity, but rarely containing albumin or casts.

The train of symptoms here outlined may be readily explained by the pathological lesion. How common it is at autopsies to find organs the vessels of which gape with open mouths, while, during life, the only condition determinable was such an association of symptoms. It is neither nephritis nor arteritis, neither myocarditis nor cerebritis, but a diffuse fibroid change, the manifestations of which are perhaps most patent in the small arteries. Thus, we see associated with this condition miliary aneurisms in the brain, which we now know to be so generally antecedent to cerebral hemorrhage. In the absence of aneurism, the vascular fibrosis may alone act as a predisposing cause of rupture. The narrowing of the cerebral capillaries may become so marked as to permit of the formation of thrombi *in situ*, thus explaining certain cases of hemiplegia in which cardiac lesion or other source of embolism cannot be detected. It is also probably in the thickening of the wall of the capillary and the narrowing of its lumen that certain cases of transient or permanent loss of power, in which the severity of the symptoms soon abates, may find explanation. The

derangement of cardiac function is a result of defective nutrition and innervation. The shortness of breath is brought about by the cardiac incompetency, by the vascular changes in the pulmonary structures, and, finally, by lowered innervation, in some cases aided by concurrent emphysema. Other visceral symptoms are due to changes of a similar nature in the respective organs. The extremities are cold because the blood-supply through the narrowed vessels is imperfect.

In the consideration of the treatment of this condition, not much need be said in the way of prophylaxis. "All the medicines in the world will not replace right living." It is the secret of longevity.

In the general management of the case, the individual is to be directed to lead a tranquil life, to avoid excitement and undue physical exertion, to partake of a light, nutritious diet, which, with benefit, may include a liberal supply of milk, and to take an occasional saline laxative.

Of medicaments, I have personally had the most gratifying results from the administration of nitroglycerin, in combination with digitalis when the cardiac action is feeble or its rhythm disturbed. Nitroglycerin is a diffusible stimulant, causing dilatation of the peripheral capillaries, thus permitting a flushing of the tissues with arterial blood, and promoting nutrition. By diminishing the resistance in the vessels, the demands upon the heart are lessened, while this organ, being better nourished, is more competent to carry on its functions. Beginning with one minim of a one-per-cent. solution three times a day, the dose is progressively increased one minim every second day, until physiological effects—flushing of the face, sensation of a band around the forehead, headache, and dizziness—are observed. Probably the most appropriate menstruum is spirits of nitrous ether, the action of which, as a nitrite, is synergistic. In administering digitalis, I like to prescribe two to five minims of the tincture in two drachms of the infusion, in this way obtaining the benefit of all the principles of the crude drug soluble in alcohol and in water.

Strychnine and atropine may prove useful adjuvants in the treatment. Under certain circumstances, it may be desirable to substitute strophanthus for digitalis. Caffeine or cocaine may fulfil certain indications. Cod-liver oil might be used as a nutrient, alcohol as a stimulant. Iodide of potassium is of doubtful utility, except during the active stage of syphilis.

The conclusions I wish to record are: That there is a pathological condition in which the manifestations of senility occur prematurely, and that the best means of combating it is by improving the general nutrition and giving tone and stability to the cardio-vascular apparatus—a healthy nutritive fluid, with a competent distributing apparatus.

